pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF ABANDONED MINE RECLAMATION

MEMO

TO Brian Bradley, Chief
Division of Mine Hazards
Bureau of Abandoned Mine Reclamation

FROM Jon J. Smoyer, P.G. 12/1/11
Environmental Services Section
Bureau of Abandoned Mine Reclamation
Cambria Office

THROUGH Pamela J. Milavec, Chief
Environmental Services Section
Bureau of Abandoned Mine Reclamation
Cambria Office

DATE December 1, 2011

RE Qualified Hydrologic Unit: Upper Blacklick Creek
Cambria and Indiana Counties

Attached is information documenting a Qualified Hydrologic Unit (QHU) on the Upper Blacklick Creek. Included are a QHU Determination form and a CD with all attachments referenced on the form. The QHU Determination form documents that the Upper Blacklick Creek meets the requirements of the Surface Mining Control and Reclamation Act Amendments of 2006, Section 402(g)(6)(A) and (B) for the expenditure of funds from an acid mine drainage abatement and treatment fund (AMD Set Aside).

Please file as appropriate and add this QHU to the statewide Hydrologic Unit Map. Also, please send me a copy of the revised map. Thank you.

Attachments

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Qualified Hydrologic Unit Determination

Surface Mining Control and Reclamation Act Amendments of 2006

Hydrologic Unit: Upper Blacklick Creek

Description of Qualified Hydrologic Unit (unit boundaries, stream segment(s), tributaries included, etc.):

The area covered by this Hydrologic Unit consists of the upper portion of Blacklick Creek and its tributaries from the headwaters downstream to just before the confluence with Two Lick Creek, just south of Homer City. For data evaluation purposes, the United States Geological Survey (USGS) stream gauging station at Josephine, Pennsylvania, will be considered the most downstream point in the unit. The USGS station is located at Latitude 40º 28' 24" and Longitude 79º 11' 01". Both the North Branch Blacklick Creek and South Branch Blacklick Creek are included in this Qualified Hydrologic Unit. The Hydrologic Unit drains approximately 193 square miles of Cambria and Indiana Counties (See Figure 1).

The segment targeted in this Hydrologic Unit has been impaired by acid mine drainage (AMD) starting in the headwaters of some of the tributaries, but is most influenced by a few large volume AMD discharges from abandoned underground coal mines. Along with the large volume of underground mine AMD discharges, the following tributaries also contribute significant AMD within the Hydrologic Unit: Pergrim Run, Coal Pit Run, Bracken Run, Schuman Run, Auld's Run and several unnamed tributaries to Blacklick Creek. The Blacklick Creek begins to show some recovery at the Village of Heshbon, approximately ten (10) miles downstream of the confluence of the north and south branches at Vintondale.

The Upper Blacklick Creek is classified as a Cold Water Fishery by the Pennsylvania Department of Environmental Protection (PA DEP) in Chapter 93 (Water Quality Standards) of the PA Code from the basin source to the confluence of the North and South Branches of Blacklick Creek at Vintondale. The main stem from the confluence of the north and south branches is classified as a Trout Stocked Fishery (TSF), although trout have not been stocked in the main stem of Blacklick Creek for decades (if ever). The tributary to the South Branch Blacklick Creek, Stewart Run, is classified as a High Quality Cold Water Fishery (HQ-CWF). Stewart Run is the only body of water within this Qualified Hydrologic Unit to attain this classification in Chapter 93.

Blacklick Creek is listed as impaired by abandoned mine drainage by PA DEP ("2008 Pennsylvania Integrated Water Quality Monitoring and Assessment Report").

Section 402(g)(6)(A):

The above Hydrologic Unit is covered under a restoration plan that addresses the abatement of the causes and treatment of the effects of AMD in a comprehensive manner?

Yes X No ____

Four (4) comprehensive restoration plans have been completed on Blacklick Creek that document the water quality problems and sources of impairment. The plans are:

1. Blacklick Creek Watershed Pollution Abatement Project: Scarlift Report No. 185 (Michael Baker, Jr., Inc., 1978).

2. Blacklick Creek Assessment and Restoration Plan (L. R. Kimball and Associates, 2005).

3. Total Maximum Daily Load (TMDL) for South Branch of Blacklick Creek. (EPA, Region III, 2005). (Replaced by No. 4 below.)

4. TMDLs for Streams Impaired by Acid Mine Drainage in the Kiskiminetas-Conemaugh River Watershed, Pennsylvania. EPA, Region III, January 29, 2010.

In addition, the Department of Environmental Protection, Bureau of Abandoned Mine Reclamation (DEP BAMR) has done extensive sampling and monitoring in conjunction with project development and the development of this Hydrologic Unit that documents and prioritizes the AMD pollution in the watershed.

Restoration plans should include the following:

- **Assessment of the problem/sources of impairment**
- **A scientific analysis of the pollution load and the known source contribution**
- **Realistic and measurable restoration goals**
- **Identification and prioritization of AML/AMD sites that are adversely affecting water quality**
- **Realistic and measurable treatment goals for discharges proposed for treatment**

Yes X No ____

A discussion of the individual restoration plans in respect to the above criteria follows:

Blacklick Creek Watershed Pollution Abatement Project: Scarlift Report No. 185:

This report covers approximately 225 square miles of Blacklick Creek from the headwaters source to the Conemaugh River, excluding the Two Lick Creek tributary (Two Lick Creek was addressed as a separate Scarlift Report). The report concludes that the Blacklick Creek is seriously polluted by acid mine drainage primarily from discharges from underground mine workings and waste coal piles.

Discharges were prioritized based on loading and feasibility of treatment due to locations and site availability. The report listed the top twenty-seven (27) AMD sources as candidate projects for investigation toward abatement. This report focused on reclamation to eliminate AMD pollution with little to no operation and maintenance. The report does acknowledge the large underground AMD discharges, but offers no solutions or recommendations.

Blacklick Creek Assessment and Restoration Plan (L. R. Kimball and Associates, 2005):

This plan covers all of the Blacklick Creek including the Two Lick Creek sub-watershed. The report relies heavily on existing data and did little to check the validity of those data. As a result, the prioritization is based upon historical and reported data that were available at the time of the report. A definite bias towards passively treatable discharges exists. The report simply acknowledges that the largest underground mine discharges are a problem, but does not present a solution and subsequently ranks the discharges lower than their corresponding environmental impact. The report does not establish specific in-stream treatment goals, but instead proposes the goal that every treatment system constructed meet the instantaneous maximum

effluent limits for surface mining facilities as described in Chapter 87.102 of PA's Environmental Regulations.

TMDL for South Branch Blacklick Creek:

In 2005, PA DEP completed a Total Maximum Daily Load (TMDL) calculation for the South Branch of Blacklick Creek. This document calculated the loading to the South Branch Blacklick Creek from AMD sources. The document was later voided by the TMDL for the entire Kiskiminetas-Conemaugh River Basin for AMD impairments discussed below.

TMDLs for Streams Impaired by Acid Mine Drainage in the Kiskiminetas-Conemaugh River Watershed, Pennsylvania:

In 2009, the Environmental Protection Agency (EPA), Region III approved a TMDL for the entire Kiski-Conemaugh Watershed which included all of this Qualified Hydrologic Unit. The TMDL found the entire watershed to not be attaining use and therefore no further loading beyond the base concentrations established in the TMDL are allowed unless loading is effectively reduced elsewhere in the watershed.

BAMR Modeling, Assessment and Proposed Projects/Restoration Plan:

None of the above described assessments or restoration plans completely satisfies the criteria of a Qualified Hydrologic Unit as defined in Section 402(g)(6)(A). Therefore, BAMR made the decision to assess the watershed and develop its own restoration plan for the proposed Hydrologic Unit in accordance with the criteria of Section 402 (g)(6)(A).

ASSESSMENT OF THE PROBLEM/SOURCES OF IMPAIRMENT:

BAMR has sampled, monitored and characterized every major water flow in the Hydrologic Unit described above. The location and source of the major AMD impairments quickly became apparent.

The largest water quality impacts in terms of loading to the described Hydrologic Unit are as follows (from the headwaters through the main stem):

1. Colver Refuse Pile Area
2. Red Mill Discharge (Commercial No. 16 Mine)
3. Refuse Piles at Nanty Glo and Pergrim Run
4. Webster Discharge (failed passive treatment system on large deep mine discharge)
5. Vintondale Boreholes from Vinton No. 6 Mine
6. Wehrum Shaft
7. Virginia No. 14 Mine Discharge to Auld's Run

A scientific approach was then taken to analyze the pollution load and prioritize these AMD sites contributing to the problem. Geochemist Workbench software by Rockware was used to model and predict the water quality changes to be achieved by addressing the sources of impairment discussed in detail below.

A SCIENTIFIC ANALYSIS OF THE POLLUTION LOAD AND THE KNOWN SOURCE CONTRIBUTION:

Geochemical modeling software by Rockware's Geochemist Workbench, was used to model and predict the changes with in-stream water quality in this Hydrologic Unit. This modeling was then used to determine realistic restoration goals for the unit. Data for the modeling were collected during low flow conditions on August 17 and 18, 2010. Low flow stream conditions were chosen as the most appropriate time to model because chemical monitoring of Blacklick Creek over the previous five (5) years has shown that low flow conditions routinely exhibit the poorest water quality. This phenomenon is likely due to the fact that the largest AMD loadings to Blacklick Creek are large discharges from underground abandoned mines. During the late summer to early fall of the year, the underground mine discharges are fed by deeper groundwater sources and comprise a larger proportion of the total stream flow than they do during higher stream-flow conditions. For this reason, late summer/early fall sampling would model the worst case stream scenario. In order to attempt to adequately model the Hydrologic Unit, every significant flow (greater than 25 gallons per minute (gpm)) of surface waters or mine drainage was sampled over the two (2) day period. Flows were measured at each sample point using in place weirs or Marsh McBirney staff and velocity meters. The samples were then analyzed at the state laboratory for every major cation and anion expected to be in the solution. The Geochemist Workbench program then models the chemical reactions proportionally on a molar basis. The waters were "reacted" in the Geochemist Workbench program starting from the upstream-most points and working downstream, just as the waters would flow together in the watershed. Minerals and oxides were allowed to precipitate and become part of the bed load, as they would be in the natural system. Weaknesses in the model are recognized. First, it is difficult to account for base flow groundwater into the system because it is difficult to accurately measure this flow. Second—post sampling—it was learned that both the Barnes and Tucker No. 15 and Bethlehem Energy Mine No. 31 treated discharges were varied over the period of data collection. The flow variation during the period of sampling at the Barnes and Tucker No. 15 Plant had a negligible effect on the model due to the fact that it was removed from the model in order to simulate the relocation of the No. 15 discharge out of the Hydrologic Unit to the West Branch Susquehanna River (discussed in greater detail below). As checks on the model, flows and chemistry were collected at critical stream points above or below significant known inflows. Despite the variable flows from the two (2) largest active mine drainage treatment plants in the unit, actual stream conditions were very closely modeled. Geochemist Workbench predicts that once the Barnes and Tucker No. 15 treated mine discharge has been removed and the Commercial No. 16, Vinton No. 6, Wehrum shaft, and Webster discharges have been treated, the Blacklick Creek will achieve a pH greater than 6.2 and iron levels less than 1.5 throughout all of the main stem reaches as described in more detail below.

REALISTIC, SPECIFIC AND MEASURABLE RESTORATION GOALS

A lower tier restoration goal of biological recovery with a recreational fishery and water quality goals of pH greater than 6.0, total iron less than 1.5 mg/l, total Al less than 0.5 mg/l and TDS less than 1,500 mg/l during normal stream flow, as described in the 2009 BAMR AMD Set-Aside Program Implementation Guidelines, has been set for the main stems of the entire Hydrologic Unit. The main stems are defined as all of the North Branch Blacklick Creek, all of the South Branch Blacklick Creek and the main stem of Blacklick Creek between Vintondale and Josephine. It is intended that the restoration goals of this Hydrologic Unit plan are met when the above described lower tier restoration goals are met at all points within the main stems of the unit. Tributaries to the North Branch, South Branch and main stem of Blacklick Creek are included in the plan in so much as projects on these tributaries may be necessary to achieve the restoration goals at points of measurement in the main stems. It is not the intention of this Hydrologic Unit Plan that the lower tier restoration goals be met at every point in every tributary in the defined Hydrologic Unit.

The Geochemist Workbench model predicts that the North Branch Blacklick Creek (2.3 miles) and Main Stem Blacklick Creek (22.9 miles) will attain the lower tier goal after the treated effluent from the Barnes and Tucker No. 15 Mine has been relocated to the West Branch Susquehanna and the four (4) phases of the Blacklick Creek Treatment Facility (BCTF) described below have been achieved. It is important to note that present day levels of pollution from all other sources of loading have been assumed to be in a steady state condition for the sake of the model. Increases in loading from other sources of AMD in the watershed may prohibit the achievement of the lower tier goal for the Hydrologic Unit.

The South Branch Blacklick Creek cannot achieve the lower tier goal of a recreational fishery and the chemistry necessary for that fishery until the Webster discharge has been addressed. The most economical way to address the Webster discharge is through a partnership with Pristine Resources which is actively treating water out of the adjacent Bethlehem Mine No. 31. The geologic structure is such that the Webster discharge could be conveyed into Mine No. 31 and treated in conjunction with the larger mine pool. A detailed report on the history and cost benefit analysis of addressing the Webster discharge is attached as Appendix A.

In conjunction with the modeling, a review was conducted to assess the effects of elevated sulfates and Total Dissolved Solids (TDS) from the proposed Blacklick Creek Treatment Facility. Sulfate levels should not increase due to the fact that no new mine drainage is being added into the Hydrologic Unit. With the removal of the Barnes and Tucker No. 15 discharge from the unit and the relocation of the Commercial No. 16 and Vinton No. 6 discharges to the Wehrum Shaft farther downstream, sulfate and TDS levels will remain about the same on the North Branch of Blacklick Creek . Currently, sulfate and TDS levels are 280 mg/l and 500 mg/l respectively at flow conditions at the mouth of the North Branch. After relocation of the Barnes and Tucker Commercial No. 16 and Vinton No. 6 discharges, sulfate and TDS are modeled to be 288 mg/l and 553 mg/l respectively. The lime used to treat the combined AMD discharges at Wehrum will increase TDS slightly due to increased calcium and magnesium in solution. However, sulfate and TDS levels below the discharge of the proposed Blacklick Creek Treatment Facility are modeled to be 385 mg/l and 659 mg/l respectively. Sulfate and TDS levels should not be detrimental to aquatic recovery in the main stem of Blacklick Creek.

The South Branch of Blacklick Creek, even after effective treatment of the Webster discharge, will still receive significant AMD pollution from Pergrim Run, Coal Pit Run, Bracken Run and Schuman Run. The main stem will still receive significant pollution from Armagh Run, Auld's Run and other minor AMD sources. As such, an upper tier goal of complete biological recovery may not be attainable in a cost effective manner and is likely an unrealistic goal. Therefore, the lower tier goal is more appropriate.

It is possible that some stretches, particularly the North Branch Blacklick Creek, may be able to achieve the upper tier goal of complete delisting from DEP's Impaired Waters List, but such a goal may not be realistic based upon the data available and present situations. The water quality in the North Branch, specifically Elk Creek, will largely be dependent upon continued reclamation and effective treatment by the active coal industry at the Colver refuse piles and the Colver deep mine discharge at the "Y" portal and is beyond the control of DEP BAMR. As such, an upper tier goal for this stretch of stream is not appropriate.

Also of particular interest is the discharge from the PA Brine Treatment - Josephine Plant located near the very lower end of the Hydrologic Unit. Currently, this plant increases the TDS in Blacklick Creek from approximately 500 mg/l above the plant to beyond the in-stream goal of 1,500 mg/l below the plant. With the removal of the Barnes and Tucker water, the Josephine Brine Plant causes TDS in Blacklick Creek to rise beyond 2,000 mg/l in the model. The PA Brine Treatment Plant is located approximately one (1) mile upstream from the lower end of the Hydrologic Unit. Without changes in discharge limits on the plant or increased assimilative capacity in Blacklick Creek, the lower most mile of the Hydrologic Unit may not be achievable in terms of the TDS goal of less than 1,500 mg/l.

As conditions in the Hydrologic Unit change, additional projects or expenditures related to maintenance of existing systems may be needed in order to maintain achievement of the restoration goals described above.

Monitoring and occasional biological assessments will be needed in order to verify and ensure achievement of the restoration goals set forth above.

IDENTIFICATION AND PRIORITIZATION OF AML/AMD SITES THAT ARE ADVERSELY AFFECTING WATER QUALITY

A significant project from outside the watershed will have some effect on this Hydrologic Unit. The Lancashire No. 15 Mine Drainage Treatment Plant project, AMD 11(0821)101.1, currently in construction, will relocate 6,500 gallons per minute of treated mine drainage from Elk Creek, a tributary to the North Branch of Blacklick Creek to the West Branch Susquehanna River as early as the fall of 2011. The Barnes and Tucker Coal Company, Lancashire No. 15 Mine pool, straddles the watershed divide between the Ohio Basin (Blacklick Creek) and the West Branch Basin. When the No. 15 Mine closed and the pool developed, a breakout occurred in the headwaters of the West Branch. Subsequent pumping and treatment at the Duman facility on Elk Creek currently directs all the water accumulated in the pool to Elk Creek to the North Branch Blacklick Creek. The Susquehanna River Basin Commission (SRBC) was interested in restoring this flow to the West Branch in order to mitigate for agricultural consumptive use further downstream. A total volume of 15.7 million gallons per day (MGD) is needed under low-flow conditions. The PA Legislature provided $6.1 million for projects that would mitigate for this impact. Restoring the Lancashire No. 15 flow to the West Branch will provide up to ten (10) MGD of the needed water, with a value to the SRBC of $3.9 million. DEP decided to construct a new treatment plant in the West Branch headwaters (the Duman treatment facility is approaching 40 years old and significant upgrades were needed). The interest from the $3.9 million will be used to supplement operating funds provided by the Barnes and Tucker bankruptcy proceedings. The alkalinity and assimilative capacity of this flow will be removed from the Blacklick Hydrologic Unit.

Two large, multi-phase, priority projects are needed to complete the Hydrologic Unit described herein. The first priority project is the Blacklick Creek Treatment Facility project consisting of four (4) separate phases. A second priority is a project to address the Webster discharge to the South Branch Blacklick Creek in Nanty Glo. Other, much smaller projects and continued operation and maintenance of passive treatment systems, will also aid in the removal to the pollution load. Specifically, three (3) passive treatment systems in Coal Pit Run, the Laurel Run Phase I and Phase II projects, and AMD/ART System in Vintondale may have to be maintained in order to achieve the restoration goals. However, cost-benefit analyses should be performed before taking on any project to help achieve the restoration goal. Treatment of small discharges, like those being passively treated on the above-named systems, are likely not a cost effective way to achieve the stated restoration goals and should be done only as a last resort when chemical and biological monitoring shows it to be absolutely necessary.

The BCTF Project is the top priority in achieving the goals set forth in this Hydrologic Unit Plan. The concept behind the BCTF Project is to combine the discharges from the Commercial No. 16, Vinton No. 6 and Wehrum Mines in order to facilitate treatment at one (1) chemical treatment plant near the Wehrum shaft. The discharges will be combined by connecting the adjacent underground mine pool through a series of drill holes and pipelines. The BCTF is proposed to be divided into four (4) phases treating the discharges described below:

BCTF Phase I - AMD 32(2467)101.1, Ramsey Run Culvert Construction. This phase is simply a redesign and construction of the culvert that carries Ramsey Run beneath Wehrum Road. This is needed because Phases II and III of the BCTF Project will relocate as much as 5,000 gpm of AMD to Ramsey Run via the Wehrum shaft. The existing culverts are inadequate and undersized and cannot carry the increased flow.

BCTF Phase II - AMD 32(2246)101.1, Vinton/Wehrum Mine Pool Connection. This phase will combine the discharges in the North Branch Blacklick Creek from the Vinton No. 6 Mine with the Wehrum Mine pool through a series of drill holes and pipelines.

BCTF Phase III -AMD 32(2246)102.1, Vinton No. 6 Borehole Plugging. This phase will plug and seal the boreholes in the North Branch Blacklick Creek once it has been determine that the flow from the Vinton No. 6 Mine has successfully been relocated to the Wehrum shaft. Simultaneous to this phase is a project to drop the Commercial No. 16 Mine into the Vinton No. 6 Mine through a vertical borehole will also take place.

BCTF Phase IV- AMD 32(2467)102.1, Treatment Facility Construction. This project will consist of the design and construction of the AMD treatment plant at Wehrum. Likely, this design will be completed as a support contract to the AMD 32(2467)102.1 construction contract and, in reality, will be completed through two (2) separate contracts.

Another necessary project will be to address the Webster discharge on the South Branch Blacklick Creek at Nanty Glo. The passive treatment system constructed for this discharge is no longer functioning as designed. The treatment of the Webster discharge is necessary for the restoration of the South Branch Blacklick Creek. Currently, the best economic option for treating this discharge is to combine it with the adjacent Mine No. 31 pool and treat the two (2) mines simultaneously at the existing Mine No. 31 treatment plant.

The coal refuse piles at Colver are being reprocessed for fuel by the Colver Power Project and will be reclaimed. This continued reclamation work will help reduce the AMD loading to Elk Creek to the North Branch Blacklick Creek. The degree to which this reclamation will reduce acid and metals loading to the Hydrologic Unit is unknown. Therefore, the conservative approach of modeling the unit with no reduced loading from the Colver Project was used. Any improvements achieved through the reclamation of the refuse at Colver will result in improvements beyond those predicted in the model.

The refuse piles at Nanty Glo are being reprocessed for fuel and reclaimed by Ebensburg Power. This reclamation will help reduce the pollutional loading to the South Branch of Blacklick Creek. Like the Colver Project, the degree to which reprocessing and reclaiming the refuse piles at Nanty Glo will improve the South Branch Blacklick Creek is unknown. The model used to establish the priorities, treatment goals and restoration goals did not include any reduction in loading from the Nanty Glo piles.

Significant loading from the Virginia No. 14 mine in the Auld's Run sub-watershed is assimilated by the main stem Blacklick Creek. However, there is little room for additional loading to the watershed in order to meet the lower tier goal. Blacklick Creek above Auld's Run is modeled to be pH 6.8, with 30 mg/l alkalinity, and no detectable iron or aluminum. Below Auld's Run, the pH drops to 6.2 and alkalinity is cut in half after the loading from Auld's Run is received. Presently, no project on Auld's Run is planned. However, in the event that conditions in the Hydrologic Unit change so that the loading from Auld's Run cannot be assimilated into Blacklick Creek while maintaining the restoration goals, a project may have to be completed to reduce the loading from Auld's Run.

REALISTIC AND MEASURABLE TREATMENT GOALS FOR DISCHARGES PROPOSED FOR TREATMENT OR ABATEMENT

The goal established for treatment of the discharges described above are Best Available Technology (BAT) limits as described in Chapter 87.102 of the Surface Mining of Coal state regulations. These limits would establish the following monthly average discharge limitations upon discharges from treatment facilities: Total iron less than 3.0 mg/L and pH greater than 6.0 and less than 9.0 at all times. In reality, the pH of the discharge will likely be slightly above 7.0 in order to achieve the iron concentration goals. If these treatment goals are met, then the restoration goals established below will be met.

Cost-Benefit Analysis of Meeting the Proposed Goals

A cost-benefit analysis of meeting the proposed goals of the described Hydrologic Unit was performed. The analysis is attached as Appendix B. The total benefit to cost ratio of restoring the Upper Blacklick Qualified Hydrologic Unit is 1.75 to 1.0. It is important to note that the benefit value is obtained solely from lost recreational use as estimated by the PA Fish and Boat Commission. It does not consider other intrinsic values such as the additional economic benefits of the infrastructure and expansion that is probable to support the opportunities that will arise with an improved Blacklick Creek. The Ghost Town Rails to Trails currently follows alongside all of the main-stem stream miles of the Hydrologic Unit with the exception of the portion of the unit in Elk Creek. Because of the trail system and its many intersections with public highways, the Upper Blacklick Creek Hydrologic Unit has a high probability of increased tourist activity beyond what is estimated by the PA Fish and Boat Commission. The benefit calculation also does not include economic benefit to industries currently operating in the unit or industries that will locate in the unit once they are no longer deterred by poor water quality. Restoration of the Hydrologic Unit may make industrial use of the stream water possible. It may also afford a lower cost of business to some industries due to a higher pollution attenuation potential which may allow for more relaxed discharge limitations. Finally, the cost-benefit analysis does not consider the economic benefits of the construction and operation of the plant itself. The construction of the plant will invariably create jobs and will pour over $12 million into the local to regional economy. The operation of the plant will create at least three (3) new job opportunities and will put over $1.2 million into the local economy annually. The benefit to cost ratio performed in order to evaluate the restoration of the Qualified Hydrologic Unit is admittedly oversimplified and does not truly consider the complex economic network and the stimulus that such a large addition in local infrastructure will present. Modeling such effects is beyond the ability of this program and is excessive for the scope of this document. However, even the most basic and oversimplified economic analysis used to compare the costs to benefits of meeting the lower tier restoration goals for the Hydrologic Unit has determined this action to be a very worthwhile environmental and economic decision.

Section 402(g)(6)(B)(i):

The above Hydrologic Unit has been significantly affected by acid mine drainage from coal mining practices in a manner that adversely impacts biological resources?

Yes X No ____

Describe and provide references (may include references to TMDL, 303(d) list, watershed assessments or remediation plans, or BAMR water and biological sampling):

The Blacklick Creek is listed as impaired by abandoned mine drainage by PA DEP ("2008 Pennsylvania Integrated Water Quality Monitoring and Assessment Report"). The 2010 Aquatic Survey of the Upper

Blacklick Creek was conducted by DEP BAMR. In general, aquatic life is impaired. The only point sampled in the Hydrologic Unit found to be unimpaired was the North Branch Blacklick Creek above Elk Creek where there are no significant mine drainage discharges. The results of the biological survey and a summary by Kay Spyker, Water Pollution Biologist, are included in Appendix C.

The biological impacts of AMD chemistry on the Upper Blacklick Creek have also been documented by other reports, both historically and more recently:

1. Blacklick Creek Watershed Pollution Abatement Project: Scarlift Report No. 185 (Michael Baker, Jr., Inc., 1978).

2. Blacklick Creek Assessment and Restoration Plan (L. R. Kimball and Associates, 2005).

3. Total Maximum Daily Load (TMDL) for South Branch of Blacklick Creek. (EPA, Region III, 2005). (Replaced by No. 4 below.)

4. TMDLs for Streams Impaired by Acid Mine Drainage in the Kiskiminetas-Conemaugh River Watershed, Pennsylvania. EPA, Region III, January 29, 2010.

Section 402(g)(6)(B)(ii):

(I) The above Hydrologic Unit contains land and water that are eligible (Section 404: Lands and water eligible for reclamation or drainage abatement expenditures under this title are those which were mined for coal or which were affected by such mining, wastebanks, coal processing, or other coal mining processes, except as provided for under Section 411, and abandoned or left in an inadequate reclamation status prior to the date of enactment of this Act [*August 3, 1977*], and for which there is no continuing reclamation responsibility under state or other federal laws).

Yes X No ____

Provide references and documentation of eligible lands and water (attach applicable signed Eligibility Determinations).

Appendix D contains the Signed Eligibility Determinations for several eligible projects in this Hydrologic Unit that have been completed on lands and waters affected by mining prior to August 3, 1977. In addition, there are many more eligible sites in this Hydrologic Unit for which no project has yet been completed.

(II) The above Hydrologic Unit contains land and water that are the subject of expenditures by the State from the forfeiture of bonds required under Section 509 or from other state sources to abate and treat abandoned mine drainage.

Yes X No ____

Provide references and documentation of state expenditures to abate and treat AMD.

A list of state funded Growing Greener AMD watershed restoration projects completed in this Hydrologic Unit can be found in Appendix E of this document.

Appendix A-History and Analysis of the Webster Mine Discharge, Nanty-Glo, PA

History, Assessment, and Recommendations for the Webster Passive Treatment System in Nanty Glo, Cambria County, PA

Executive Summary

The Pennsylvania Department of Environmental Protection – Bureau of Abandoned Mine Reclamation (PADEP-BAMR) is developing a Qualified Hydrologic Unit (QHU) to include portions of Blacklick Creek in Indiana and Cambria Counties. The Qualified Hydrologic Unit is needed in order to spend Title IV set-aside funds for watershed restoration activities. At question is whether or not to include the South Branch Blacklick Creek in the QHU. The restoration of South Branch Blacklick Creek to a recreational fishery can be achieved through the adequate treatment of one large abandoned underground mine discharge known as the Webster discharge, located in Nanty Glo, Cambria County, Pennsylvania. A passive treatment system was constructed in 2003 and completed in 2004 on the Webster discharge, but it is failing to adequately treat the discharge. The project to construct the system was sponsored by the Cambria County Conservation and Recreation Authority (CCCRA) with feasibility and design oversight, and majority share funding from the U.S. Army Corps of Engineers (Corps). Questions remain as to who is responsible for the repair and operation of the Webster system. The inclusion of the South Branch Blacklick Creek, and ultimately the Webster discharge, into the QHU is dependent upon establishing responsibility for the Webster system and developing a plan to address the problem of inadequately treated water from the Webster site. From a technical standpoint, passive treatment of the Webster discharge cannot be sustained. BAMR has reviewed and evaluated treatment alternatives and performed economic analyses. The best technical, and likely most economical, alternative is to partner with private industry and treat the Webster discharge at the existing adjacent Mine No. 31 Treatment Plant. The Mine No. 31 Plant has the available capacity and would provide for the most reliable treatment of the Webster discharge. Pursuing treatment at the Mine No. 31 facility is recommended. The entity responsible to act on this recommendation has not yet been determined.

Introduction

The PADEP-BAMR is currently in the process of developing a QHU for portions of the Blacklick Creek Watershed. As required and described by Section 402(g)(6) of the Surface Mining Control and Reclamation Act of 2006, development of a QHU will enable monies be set aside from the annual Abandoned Mine Land (AML) grant for the purposes of treating and abating mine drainage to be used in the Blacklick Creek Watershed. The QHU includes a very specific, detailed plan that contains measurable restoration goals. Most importantly, it is fully intended that BAMR and its partners will accomplish the goals and projects described in the QHU. Currently, BAMR is trying to decide whether or not to include the South Branch Blacklick Creek in the QHU. Stream monitoring and modeling has shown that the restoration of the South Branch Blacklick Creek depends largely upon the successful treatment of one large mine discharge from an abandoned underground coal mine known as the Webster Mine. A project to treat the discharge was completed in 2004, but is not working effectively, nor currently generating an effluent capable of restoring the South Branch Blacklick Creek to a recreational fishery. The project was a partnership among several organizations including the Corps, CCCRA, PADEP and others. The Corps was the lead organization and provided the design and construction oversight as well as the vast majority of the funding to the project. To date, there has been no clear effort to repair, correct, or replace the Webster system. If there is no planned follow-up or responsibility to be taken for the failing Webster Passive Treatment System, then it is neither logical nor financially responsible to include the South Branch Blacklick Creek and subsequently the Webster discharge in the QHU. In other words, if Webster is to remain an inadequately treated discharge, then restoration goals for the South Branch Blacklick Creek will not be achieved. Moreover, if the plan developed by some other party to address the Webster discharge is technically inadequate to achieve the necessary restoration goals, then BAMR may choose not to include the South Branch Blacklick Creek in the QHU. The purpose of this report is to summarize the history of the problems at Webster and determine what needs to be done in order to correct those problems.

Project and Site Summary/ History

The mine drainage emanating from the Webster Mine in the Borough of Nanty Glo, Cambria County, is the single largest deep mine discharge and second largest pollutional load to the South Branch Blacklick Creek. Pergrin Run a tributary located adjacent to the Webster site actually contributes more AMD loading. Pergrin Run receives run-off and shallow groundwater flow from abandoned, pre-act refuse piles that are currently being re-processed for fuel by Ebensburg Power (AMD loading is expected to decrease as these piles are re-processed). The Webster Mine was operated by Webster Coal & Coke Co., Pennsylvania Coal & Coke Co and finally Dorsch Coal Co. Through its life, the mine was known as the Webster Mine, Webster No. 14 Mine, Nanty-Glo No. 4 Mine and lastly the Dorsch No.1 Mine. From this point forward the mine will be referred to as the Webster Mine. The mine was abandoned in October 1950. The Webster Mine is located in the Lower Kittanning Coal seam on the northwestern limb of the Johnstown syncline such that the coal dips to the southeast. The mine was developed in such a manner that a portion of the mine was developed down-dip of the main entry and a portion of the mine was developed in the up-dip direction. As a result, approximately two-thirds (2/3) of the mine that was developed down-dip is currently inundated and the one-third (1/3) developed

up-dip are “free draining” to the discharge at the portal. The mine discharge contains on average, 21 mg/l iron, 35 mg/l aluminum, 5 mg/l manganese and 330 mg/l hot acidity. The discharge ranges from 100 gpm to over 1,000 gpm with an average flow of approximately 400 gpm.

In the early 1990s a local, grass-roots, consortium of businesses and local governments, The Nanty Glo Industrial Development Association (NGIDA), (later becoming the Blacklick Valley Industrial Development Association (BVIDA), approached U.S. Congressman John Murtha looking for a solution to the Webster discharge. It was believed by NGIDA that the pollution of the Blacklick Creek was stifling economic development in the area. In 1990, the Corps was engaged by Representative Murtha on behalf of the NGIDA to assess and try to remedy the Webster discharge. On October 5, 1990, a United States House of Representatives Resolution of the Committee on Public Works and Transportation authorized the Pittsburgh District of the Army Corps of Engineers to conduct a feasibility study of alternatives to restore the South Branch Blacklick Creek. The Corps obtained authorization to “develop and implement restoration projects for abatement and mitigation of surface water quality degradation caused by abandoned mines and mining activity in such basin” in Section 331 of the Water Resources Development Act of 1992. The CCCRA volunteered to be the necessary local sponsor for the Corps’ work. Funding for the design and construction of the Webster system came separately as needed and approved in the federal budget.

Bureau of Abandoned Mine Reclamation Involvement

BAMR had long been aware of the environmental impacts of the Webster discharge. Because one of the requirements of a Corps’ project is match by the local sponsor, CCCRA asked BAMR to help provide the matching funds both through the state Growing Greener grant funds as well as the SMCRA Title IV funds available to the Abandoned Mine Land (AML) program. In addition, BAMR was called upon when difficulties in construction were encountered. A breakdown of funding for the project follows:

Funding to Date

The local Sponsor for the Project is the CCCRA.

Reconnaissance Level Assessment

Estimated at $250,000 funded by the Corps (exact total unknown)

Feasibility Study Phase

Total Projected Cost:	$325,000
Sponsor Share:	$100,000

Share Funding Breakdown:	$72,000	- Department of Environmental Protection
	$8,000	- Local
	$20,000	- Heinz Foundation

Actual Cost:	$312,683.16
Sponsor Share:	$96,210.21
US Army Corps Share:	$216,472.95

Unused Sponsor Share Funds rolled into Design and Specification Phase

Design and Specifications Phase

Total Projected Cost:	$350,000	
Sponsor Share:	$87,500	
Share Funding Breakdown:	$87,500	- Department of Environmental Protection
Consultant Design Cost; (GAI Consultants, Inc.)	$150,501	
Additional Cost from Claim	$25,000	- Sponsor Share of Claim was $12,500
Total	$175,501	- Included in the Total Project Cost

Consultant design cost does not include construction oversight or consultation.

Last known Actual Cost:	$311,183.31
Last known Sponsor Share	$75,334.39
US Army Corps Share:	$235,848.92

Amount of unused Sponsor Share refunded to the Department is $12,265.75

Construction Phase

Total Projected Cost:	$3,963,725.00	
Projected Sponsor Share (25%):	$990,931.00	
Current Share Funding Breakdown:	$605,000	- Growing Greener Grant
	$201,253	- BAMR Title IV- portal wet-seal drain
	$74,700	- Local and Other
	$187,127	- Current Sponsor Credits for In-kind Services
Total	$1,068,080	

Note: Cost and Share are projected pending final accounting.

Summary of Costs for all Phases

Reconnaissance Level Study	$250,000.00
Feasibility Study Phase -	$312,685.16
Design Phase -	$311,183.31
Construction Phase -	$3,919,490.75
Total	$4,793,359.22

Funding Sources:	$3,769,406.22	- Federal
	$605,000.00	- DEP Growing Greener Grant to Local Sponsor
	$316,253.00	- DEP/BAMR Grants to Local Sponsor
	$20,000.00	- Heinz Foundation
	$82,700.00	- Local

The Webster Passive Treatment System was constructed in 2003 and 2004. The system came on-line in the summer of 2004 and successfully treated the discharge for a period of approximately two years. In December 2006, the effluent quality from the system sharply declined and has not recovered. The Webster system cannot be classified as a complete failure. The system does continue to remove approximately 150 mg/l of acidity, roughly one-half (1/2) of the iron loading and one-third (1/3) of the aluminum loading of the raw discharge. However, this partial treatment is insufficient to restore the South Branch Blacklick Creek to a recreational fishery. Performance of the system continues to slowly decline with time.

Establishment of Treatment Goal

In order to evaluate whether an action to treat the Webster discharge is a good decision, the level of treatment, or effluent limits, for the discharge needs to be established. In conjunction with developing the QHU for Blacklick Creek, BAMR has completed detailed modeling of low flow conditions for the South Branch Blacklick Creek. If BAMR were to include the South Branch Blacklick Creek in a QHU, the minimum acceptable restoration goal for the South Branch Blacklick Creek would be the lower tier goals as described in BAMR's 2006 AMD Set-Aside Implementation Guidelines document. Specifically, the goal would be to restore the South Branch to a recreational fishery with water quality goals of pH>6.0, total iron <1.5 mg/l, total Al <0.5 mg/l and TDS < 1,500 mg/l. Using existing data from stream monitoring and Rockware's Geochemist's Workbench software, it has been determined the Webster discharge would have to be treated to a pH of 7.0, 7.0 mg/l total Fe, <.5 mg/l total Al, with 75 mg/l of free alkalinity before discharge in order to achieve the in-stream goal stated above. The 75 mg/l of alkalinity is needed to help neutralize the acid loading, largely from the aforementioned Pergrin Run, necessary to achieve the restoration goals for the South Branch Blacklick Creek. In reality, Best Available Technology Limits would be imposed and treatment of the Webster discharge to this standard would achieve the restoration goals for the South Branch Blacklick Creek provided that the 75mg/l of free alkalinity are discharged along with the low metal levels. This level of treatment is critical to the items discussed under the Recommendations section below.

Conclusion

Multiple sources of funding and more than two decades of time have been used to study, design and attempt to treat the Webster discharge. Approximately 77 percent of the project was funded through the Corps. The Commonwealth of Pennsylvania, through the Growing Greener Program, funded approximately 13 percent of the total project. BAMR funded approximately 8 percent of the project (for the installation of the mine seal and drain as a Priority 2 health and safety issue and $115,000 in Growing Greener funds, included in the G2 percentage, for property settlement). The remaining percentage was made up by local support and the Heinz Foundation.

The chemistry and flow volume of the raw water of the Webster discharge has not changed since the passive treatment system was designed and constructed. A review of the raw water inflow shows that the discharge has consistently contained around 21 mg/l iron and 35 mg/l aluminum with an average flow of around 400 gpm with peaks greater than 1,000 gpm; virtually the same as present conditions. The system is receiving the same load as was flowing from the Webster Mine during the period of background monitoring. Additional loading to the system beyond that which could have been documented in background conditions is not an excuse for the system failure.

The passive treatment of the Webster discharge continues to fail. The system consists of inappropriately applied technology given the flow and chemistry of the mine discharge. Admittedly, in 2000 through 2004, at the time of site design and construction, passive treatment technologies were being attempted on increasingly more aggressive waters. The long term success of attempting to passively treat large volume, moderate to high metal discharges was largely unknown and undocumented. Over the last decade, several passive treatment system failures and the opportunity to "autopsy" passive systems have allowed for some general classification and assessment of potential success or failure of passive treatment technologies. The combination of iron and aluminum hydroxide solids that have precipitated in the Webster treatment cells has likely caused the flow of mine drainage through the beds to form channels or "short circuit", thereby limiting its retention time and amount of treatment available in the bed. In addition, the limestone has likely covered with hydroxide precipitates so that little fresh mineral surface on the limestone is available for treatment. The chemistry and flow of the discharge are not suited to passive treatment. The Webster discharge would rank as a high risk discharge on the passive treatability matrix established by BAMR in 2009 in the AMD Set-Aside Implementation Guidelines. Based upon BAMR guidelines (established after Webster and many other systems were constructed) a passive treatment system would not have been designed and constructed for the discharge due to a high probability of system failure. The inappropriate nature of the treatment technology employed for the Webster discharge is also supported by Paul Ziemkiewicz, PhD, consultant for the Corps, in his August 2009 draft report to assess the failure of the system. The Ziemkiewicz report is attached. It is not known whether this report was ever printed in a final form.

The Corps was the primary funding source and had the primary technical role in approving the design and contracting the system's construction. In addition, it is unclear whether there was to be scheduled flushing maintenance events for this system. An operations and maintenance plan was never given to CCCRA and the role of specifically who locally was/is responsible for the operation and maintenance of the system was never clearly defined.

The Corps sent a letter to the CCCRA dated February 23, 2011, stating their intention to develop a contract to flush the system and develop the operation and maintenance manual for the system in the spring or summer of 2011.

Recommendations/Alternative Solutions

Ziemkiewicz (2009) discusses options to revive or restore the Webster Passive Treatment System. Two options, high pressured flushing and draining with partial reconstruction of the system, are temporary solutions to a long term problem. Either of these options would, sooner rather than later, result in more of the same type of failure issues at the Webster site. His third option of configuring the system into a hydrated lime based active treatment facility is the only option that has a realistic, long-term chance of treatment success. Unfortunately, chemical treatment comes with high operation and maintenance costs and, when compared to passive treatment, is labor intensive. Nonetheless, converting the Webster Treatment system to a lime based active treatment plant is a viable alternative. When this alternative is more closely examined, four questions, for which there appear to be no easy answer, arise. Those questions are:

Who is going to pay for the construction of this new treatment plant?

Who is going to pay for operation and maintenance of this new facility?

Who is going to provide the daily labor needed to run the site?

Where will the large volume of mine drainage treatment sludge that is generated by lime based treatment be disposed?

The estimated costs associated with converting the Webster Passive Treatment site to a lime base active treatment system have been developed in OSM's AMD Treat Program and are included in the Benefit Cost Analysis for the various alternatives. The theoretical system consists of a lime dosing silo and conversion of the existing wetlands system into a settling basin. In addition, a secondary "sludge drying bed" is included to which the treatment sludge can be pumped and allowed to dry without complete interruption of treatment. The estimated capital costs for this conversion is $465,000. It is conservatively assumed that the mine drainage treatment sludge will dry to allow for haulage by conventional dump trucks and that a free (no tipping fee) disposal site (AML site) can be found within five miles of the Webster site.

The total annual operating cost of the lime base treatment system is estimated in AMD Treat to be $153,000. That cost of treatment equates to $0.73/1000 gallon treated.

An alternative to building a new lime based active treatment system in order to achieve the stated treatment goals may be possible. In the 1991 Reconnaissance Level Assessment completed by L. Robert Kimball and Associates for the Corps, two alternatives to combine the Webster discharge with the adjacent Mine No. 31 pool were briefly discussed. Neither alternative was ever selected and fully examined as a preferred alternative. The idea is still valid and warrants discussion. Pristine Resources Inc., the company responsible for the holding of any assets and liabilities left from the Bethlehem Steel bankruptcy is currently operating a mine drainage treatment plant approximately one-half (1/2) mile upstream on South Branch Blacklick Creek from the Webster site. This plant is known as the Mine No. 31 Plant because it maintains and treats the pool from Bethlehem Energy Mine No. 31. Mine No. 31 is located adjacent to and

down dip of the Webster Mine. The two mines share a common solid coal barrier. Furthermore, because of the way the two mines were independently developed, the elevation of the portal (discharge) of the Webster Mine is higher than the portal and bottom of the air shaft for Mine No. 31. A preliminary investigation reveals that it may be entirely possible to direct the Webster discharge into Mine No. 31 via gravity flow using nothing more than a few hundred feet of appropriately sized pipe. The Webster discharge could then be treated in combination with Mine No. 31 water at the existing treatment plant. Preliminary discussions with staff from Pristine Resources indicate that they do have the capacity at their Mine No. 31 Treatment Plant to adequately treat the water from Webster. There are several positive aspects to the concept of treating Webster at the Mine No. 31 treatment facility:

- An economy of scale is realized by utilizing the extra capacity of the existing facility. The Mine No. 31 facility can treat the discharge at a lower cost than would be realized through the independent treatment of the Webster discharge.
- The capital costs of simply connecting the Webster discharge to the Mine No. 31 pool would be much lower than the capital costs associated with converting the Webster Passive Treatment site into a lime based active treatment facility.
- The labor issue associated with active treatment of the Webster discharge would be resolved. Pristine Resources already has staff employed to treat Mine No. 31. No extra staff would be needed.
- The sludge disposal issue associated with lime based treatment of the Webster discharge would also be resolved. Pristine Resources injects their treatment sludge back into Mine No. 31 in a portion of the mine where it is unlikely to recycle back to the pumps.
- The high peak, surge flows from the Webster Mine can be more easily treated because the storage capacity of Mine No. 31 will buffer the flashy effects of the relatively smaller and relatively shallow Webster Mine.
- The storage available in Mine No. 31 increases the probability of a more reliable treatment operation. If treatment operations are disrupted at Mine No. 31, causing the plant to be temporarily taken offline for repairs, the mine drainage to be treated can accumulate in the mine to be treated at a later date. This would not be the case at an active treatment plant located at the Webster portal. The structural setting is such that the mine drainage would continue to flow from the portal whether or not the plant is operational. Because of the large amount of environmental degradation already known to occur from the Webster discharge, a treatment plant located at the Webster passive site would have to operate continuously with virtually no interruption, including during periods of scheduled maintenance. Such a treatment goal is extremely difficult to achieve.
- Future operation, maintenance, and monitoring decisions and problems are not incurred by any government agency. The future treatment of the Webster discharge essentially becomes part of the Mine No. 31 treatment operation.

- The Mine No. 31 treatment site is more remote and secluded from a population center. The treatment operation would have less impact to and would not be visible to the community of Nanty Glo.

There are also several issues that would have to be more closely examined before the concept of treating Webster with the Mine No. 31 mine pool could be made a reality:

- Mine No. 31 is currently treating water under Title V SMCRA and NPDES permits. The permit requirements, as well as trust fund requirements, would have to be closely reviewed due the increased treatment liability associated with taking on the Webster discharge.
- Will the routing of the Webster discharge into Mine No. 31 significantly change the water chemistry to be treated at the Mine No. 31 facility?
- What is the total present value cost associated with the perpetual treatment of the Webster discharge at Mine No. 31 that would be required by Pristine Resources in order to minimize their risks to make this concept attractive? How do those costs compare to the value of the economic and environment benefits of treating the Webster discharge?
- What form would a legal agreement have to take and who would be party to such agreement if Pristine Resources would agree to take the Webster discharge?

The capital cost to pipe the Webster water into Mine No. 31 is estimated to be $76,333. The breakdown of the derivation of that cost is attached.

Based upon the data provided to the Department in conjunction with establishing a trust fund for water treatment liability, Pristine Resources has incurred an average cost of approximately $0.51/thousand gallons over the last five years to operate their Mine No. 31 Plant. Those costs and the volume of water pumped appear to be fairly consistent over this time period. Assuming that the Webster Mine drainage will not significantly worsen the Mine No. 31 pool, it can be assumed that the cost to treat the addition of the Webster water at the Mine No. 31 Plant will be of similar cost to Pristine Resources. At an average flow of approximately 400 gpm (210,240 thousand gallons/year) from the Webster Mine, this cost to Pristine would amount to $107,222 annually. It should be noted that there was no provision for recapitalization costs in this figure. It is assumed that the flow of Webster water into Mine No. 31 will not increase the unit cost of the operation. It is also based on Pristine meeting existing BAT effluent limits at their Mine No. 31 Plant. If the discharge limits for the Mine No. 31 facility would be made more restrictive, the price of treatment would, of course, increase. It is also unrealistic for Pristine Resources to take on additional treatment liability at their costs. There needs to be some financial motivation for Pristine Resources to accept the risks and liability that would be acquired with the Webster mine water.

Cost benefit analyses to treat the Webster discharge to previously described effluent limits have been developed for treating Webster independently as well as for the combined treatment at the Mine No. 31 Plant. There is a strongly positive benefit to cost ratio for both scenarios. The benefit to cost ratio for constructing and operating an independent lime based treatment system

for the Webster discharge for 50 years is 3.3 to 1. However, the alternative of piping the Webster discharge into Mine No. 31 provides for the most reliable benefit at the lowest cost. The Mine No. 31 combined treatment option for 50 years time provides for a benefit cost ratio of nearly 4.1 to 1. ***In fact, if this concept were acted upon two decades ago and the monies used to study, design, and construct the existing Webster Passive Treatment System were placed in trust, it would have provided for the treatment of the Webster water at the Mine No. 31 Plant for at least the next 50 years.***

It is recommended that the option of piping the Webster discharge into Mine No. 31 for treatment at the existing Mine No. 31 Treatment Plant be fully explored and negotiated.

It is recommended that the future roles of the agencies and groups that developed, designed, and had a hand in constructing the Webster Passive Treatment System, specifically the Corps, be established so that BAMR can make an informed decision as to whether or not its appropriate to include the South Branch Blacklick Creek in the QHU.

Finally, and most importantly, if the Webster discharge is to be treated, it should be treated in the manner that can most effectively achieve the treatment goals previously described for the lowest total cost.

Appendix B-Cost Benefit Analysis of Completing the Upper Blacklick Creek Qualified Hydrologic Unit

Benefit-Cost Analysis for the Red Mill, Vinton#6, Wehrum and Webster Discharges (Blacklick Creek Watershed)

To determine the value of the benefits of restoring the described portion of the watershed, the following information was inferred from the Department's *AMD Set-Aside Program Implementation Guidelines, Revised Draft – July 15, 2009,* Appendix C, Recreational Use Loss Estimates for PA Streams Degraded by AMD 2006 and Chapter 93, Water Quality Standards of the DEP's regulations. For unknown reasons, the North Branch Blacklick Creek and main stem Blacklick Creek are not listed by the Pennsylvania Fish and Boat Commission for a recreational use loss. These stream segments are obviously degraded by AMD. Communication with Steven Kepler, Fisheries Biologist with PFBC confirmed the appropriateness of the recreational use loss estimates used below. Both streams are assumed to be restored to Trout Stock Fisheries (TSF).

The Red Mill (Commercial #16), Vinton #6 and Wehrum discharges are proposed to be treated at one combined treatment plant at Wehrum.
The Webster discharge will be addressed as a separate and independent lime based AMD treatment system.

North Branch Blacklick Creek from Red Mill Discharge to the confluence with the South Branch, South Branch Blacklick Creek from the Webster Discharge to the confluence with the North Branch and main stem Blacklick Creek from the confluence of the north and south branches to the confluence with Two Lick Creek.
State Water Plan: 18D
Impaired miles potentially restored – 32.7 miles (22.9 miles of the main stem Blacklick Creek, 2.3 miles of North Branch Blacklick Creek, and 7.5 miles of South Branch Blacklick Creek.)
Chapter 93 Designations: Trout Stocked Fishery (TSF) for Main Stem Blacklick Creek;
Cold Water Fishery (CWF) for North Branch Blacklick Creek
Cold Water Fishery (CWF) for South Branch Blacklick Creek.
PA Fish and Boat Commission Projected Use: Trout Stocked Fishery (TSF) for all 3 streams
Use Rate: 1100 trips/year/mile
Lost Value: 32.7 miles x 1100 trips/year/mile x $71.61/trip = $ 3,363,521.70 per year

Total Lost Value = $3,363,521.70/year

Analysis of Benefits:

The net present value (NPV) of the benefits can be calculated using the uniform series, present worth equation or values extracted from the uniform series present worth value table.

The annual economic lost values of the portions of the Blacklick Creek Watershed identified above are the basis of the project's NPV benefit evaluation. The lost value is $3,363,521.70 per year. The following parameters are applied to the NPV equation:

n = 50 years
i = 5 %
USPWF = 18.25593

Net Present Benefit Value = $3,363,521.70 x 18.25593 = $61,404,216.71

Analysis of Cost:

The capital costs for treating the discharge with an active lime treatment facility utilizing clarifier technology were estimated by BAMR for the proposed Wehrum Treatment Plant based upon our recent experience with the Barnes and Tucker Lancashire No. 15 plant, and Hollywood Treatment plant design and construction bid packages. A simple lime dosing silo, utilizing the failed passive treatment beds as settling ponds was modeled for the Webster discharge in Nanty Glo. While the primary responsibility for the Webster system lies with the US Army Corps of Engineers and local project partners, the proposed hydrologic unit cannot be completed until the Webster discharge is addressed. As such, costs to treat the Webster discharge are included.

Total capital construction cost estimate for Wehrum Plant Project = $ 11,900,000.00
The estimated O&M costs for Wehrum Plant from AMD Treat program = $1,033,047.00/year
Total capital construction costs to pipe Webster discharge into Mine 31 to be treated by Pristine Resources = $76, 333.00
The estimated O&M costs Webster discharge treatment at Mine 31 = $136,565.00
Total capital costs = 11,900,000 + $76,333.00 = $11,976,333.00
Total O&M costs = $1,033,047.00 + $136,565.00 = $1,169,612/year
The estimated O&M costs for the treatment systems are expressed in terms of Net Present Value;

Note: The following parameters are applied to the NPV equation:

n = 50 years
i = 5 %
USPWF = 18.25593

Total NPV O&M Costs = $21,352,354.8

The NPV of the costs is determined by adding the capital cost of the treatment systems and the present value of the annual O&M costs over the 50 year life of the facility.

Note: Total capital cost = NPV capital cost

Therefore, the project's NPV cost = NPV capital cost + NPV of the O&M
= $12,441,853.00+ $21,352,354.80
= $33,794,208

Benefit-Cost Ratio:

Benefit-Cost Ratio = Total Benefit Value / Total Cost Value
= $61,404,216.71/ 33,794,208
= 1.82
1.82 : 1.0

Methods and assumptions used in this analysis:

1. The portions of watershed defined above are designated and to be restored to a Trout Stock Fishery and that the value lost as defined for similar streams are justifiable and applicable.

2. Any costs associated with real estate acquisition are not included.

3. The capital construction costs are based upon the assumption that the Department will design and construct the facility using its established contracting procedures.

4. The impaired portions of the Blacklick Creek Watershed named above, having the potential to be restored to their intended uses, were derived by analysis of all available water quality and biological assessment data. However, additional biological sampling needs to be performed in order to determine the specific degree of impairment and potential for recovery.

5. Any other options associated with the treatment of the Webster discharge, such as partnering with other local entities, will result in comparable or lesser costs to those proposed above such that the costs associated with this analysis are conservative.

Appendix C-Biological Assessment of Upper Blacklick Creek

Benthic macroinvertebrate sample summary

Station ID 20100818-1328-kspyker BCBW
Stream Name Blacklick Creek (01169762) **Stream Code** 43979 **Strahler** 5
Survey ID 60918 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1328 **Latitude** 40.4629497 **Longitude** -78.9565732
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
BCBW - Blacklick Creek below Wehrum. Next to road.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 4

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Leuctra	1	0	SH	2	2	
Nigronia	1	2	PR	3	3	
Ceratopsyche	1	5	FC	4	4	
Ceratopogonidae	1	6	PR	4	4	

Benthic macroinvertebrate sample summary

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Survey ID 60918 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1328 **Latitude** 40.4629497 **Longitude** -78.9565732
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

		Standardized Metric Values						
		Freestone Riffle-Run						
	Raw Metric	2009	2009	6D200			Multihabitat	
Metric Names	Limestone	small	large	2007	2D100		2006	2009
Total Richness	4	12.1	12.1	11.4		12.9	21.6	22.2
Ephemeroptera Richness	0					0.0		
Trichoptera Richness	1					9.1		
EPT Richness	2			8.7	13.1	11.8	25.0	25.0
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	1	5.3	5.6					
Beck's Index (version 3)	4	10.5	13.3	10.3				
Beck's Index (version 4)	3				15.1	13.6		25.0
FC + PR + SH Richness	4				34.5			
Hilsenhoff Biotic Index	3.25	83.2	90.0	82.1	100.1		107.3	109.6
% Inolerant Individuals (PTV 0-3)	50.0	59.2	75.2				190.1	
% Intolerant Individuals (PTV 0-	75.0			81.1				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	1.39	48.4	49.0	47.9		57.0	72.2	65.1
IBI score		**36.5**	**40.9**	**40.2**	**32.5**	**17.4**	**69.8**	**56.2**

BCG Richness Ratio	1.00	**% Ephemeroptera**	0.0	**% Baetis**	0.0	**% Chironomidae**	0.0
BCG % Individuals Ratio	1.00	**% Plecoptera**	25.0	**% Ephemerella**	0.0	**% Simuliidae**	0.0
EV Indicator Taxa		**% Trichoptera**	25.0	**% Dominant Taxon**	25.0	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	13	**5. Channel Alteration**	19	**9. Contition of Banks**	15
2. Epifaunal Substrate	9	**6. Sediment Deposition**	17	**10. Bank Vegetative Protection**	18
3. Embeddedness	8	**7. Frequency of Riffles**	10	**11. Grazing/Disruptive Pressure**	13
4. Velocity/Depth Regimes	10	**8. Channel Flow Status**	10	**12. Riparian Vegetative Zone Width**	11

Instream Score (1. + 2. + 3. + 6.) = 47 **Riparian Score** (9. + 10. + 12.) = 44 **Total Score =** 153

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-1025-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100818-1450-kspyker BCAW
Stream Name Blacklick Creek (01169762) **Stream Code** 43979 **Strahler** 5
Survey ID 60919 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1450 **Latitude** 40.4706039 **Longitude** -78.9495667
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
BCAW - Blacklick Creek above Wehrum.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 56

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Nigronia	4	2	PR	3	3	
Ceratopsyche	28	5	FC	4	4	
Cheumatopsyche	6	6	FC	5	5	
Optioservus	5	4	SC	4	4	
Chironomidae	13	6	CG	5	5	

Benthic macroinvertebrate sample summary

Station ID 20100818-1450-kspyker BCAW
Stream Name Blacklick Creek (01169762) **Stream Code** 43979 **Strahler** 5
Survey ID 60919 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1450 **Latitude** 40.4706039 **Longitude** -78.9495667
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

		Standardized Metric Values						
		Freestone Riffle-Run						
	Raw Metric	2009	2009	6D200			Multihabitat	
Metric Names	Limestone	small	large	2007	2D100		2006	2009
Total Richness	5	15.2	15.2	14.3		16.1	27.0	27.8
Ephemeroptera Richness	0					0.0		
Trichoptera Richness	2					18.2		
EPT Richness	2			8.7	13.1	11.8	25.0	25.0
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	0	0.0	0.0					
Beck's Index (version 3)	1	2.6	3.3	2.6				
Beck's Index (version 4)	2				10.1	9.1		16.7
FC + PR + SH Richness	3				25.9			
Hilsenhoff Biotic Index	5.04	61.2	66.2	60.4	73.7		78.9	80.6
% Inolerant Individuals (PTV 0-3)	7.1	8.5	10.7				27.2	
% Intolerant Individuals (PTV 0-	66.1			71.4				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	1.33	46.4	47.0	45.9		54.7	69.2	62.4
IBI score		**22.3**	**23.7**	**33.9**	**24.5**	**18.3**	**54.6**	**52.1**

BCG Richness Ratio	0.25	**% Ephemeroptera**	0.0	**% Baetis**	0.0	**% Chironomidae**	23.2
BCG % Individuals Ratio	0.08	**% Plecoptera**	0.0	**% Ephemerella**	0.0	**% Simuliidae**	0.0
EV Indicator Taxa		**% Trichoptera**	60.7	**% Dominant Taxon**	50.0	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	15	**5. Channel Alteration**	15	**9. Contition of Banks**	15
2. Epifaunal Substrate	13	**6. Sediment Deposition**	15	**10. Bank Vegetative Protection**	18
3. Embeddedness	10	**7. Frequency of Riffles**	13	**11. Grazing/Disruptive Pressure**	20
4. Velocity/Depth Regimes	16	**8. Channel Flow Status**	8	**12. Riparian Vegetative Zone Width**	18

Instream Score (1. + 2. + 3. + 6.) = 53 **Riparian Score** (9. + 10. + 12.) = 51 **Total Score =** 176

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-1025-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100818-1515-kspyker SB01
Stream Name South Branch Blacklick Creek (01188014) **Stream Code** 44618 **Strahler** 2
Survey ID 60920 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1515 **Latitude** 40.4825496 **Longitude** -78.9226886
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
SB01 - South Branch Mouth - Heavy flocculant in stream.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 1

				BCG Attribute		
Taxa Name	**Individuals**	**PTV**	**FFG**	(coldwater)	(warmwater)	*any EV indicator taxa names are*
Ceratopsyche	1	5	FC	4	4	

Benthic macroinvertebrate sample summary

Station ID 20100818-1515-kspyker SB01
Stream Name South Branch Blacklick Creek (01188014) **Stream Code** 44618 **Strahler** 2
Survey ID 60920 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1515 **Latitude** 40.4825496 **Longitude** -78.9226886
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

Metric Names	Raw Metric	Standardized Metric Values						
	Limestone	2009 small	2009 large	Freestone Riffle-Run 6D200 2007	2D100		Multihabitat 2006	2009
Total Richness	1	3.0	3.0	2.9		3.2	5.4	5.6
Ephemeroptera Richness	0					0.0		
Trichoptera Richness	1					9.1		
EPT Richness	1			4.3	6.5	5.9	12.5	12.5
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	0	0.0	0.0					
Beck's Index (version 3)	0	0.0	0.0	0.0				
Beck's Index (version 4)	0				0.0	0.0		0.0
FC + PR + SH Richness	1				8.6			
Hilsenhoff Biotic Index	5.00	61.7	66.7	60.8	74.2		79.5	81.2
% Inolerant Individuals (PTV 0-3)	0.0	0.0	0.0				0.0	
% Intolerant Individuals (PTV 0-	100.			108.1				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	0.00	0.0	0.0	0.0		0.0	0.0	0.0
IBI score		**10.8**	**11.6**	**28.0**	**17.9**	**3.0**	**32.9**	**33.2**

BCG Richness Ratio	0.00	**% Ephemeroptera**	0.0	**% Baetis**	0.0	**% Chironomidae** 0.0
BCG % Individuals Ratio	0.00	**% Plecoptera**	0.0	**% Ephemerella**	0.0	**% Simuliidae** 0.0
EV Indicator Taxa		**% Trichoptera**	100.0	**% Dominant Taxon**	100.0	**% Prosimulium** 0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	13	**5. Channel Alteration**	15	**9. Contition of Banks**	15
2. Epifaunal Substrate	13	**6. Sediment Deposition**	15	**10. Bank Vegetative Protection**	17
3. Embeddedness	8	**7. Frequency of Riffles**	16	**11. Grazing/Disruptive Pressure**	12
4. Velocity/Depth Regimes	10	**8. Channel Flow Status**	10	**12. Riparian Vegetative Zone Width**	12

Instream Score (1. + 2. + 3. + 6.) = 49 **Riparian Score** (9. + 10. + 12.) = 44 **Total Score =** 156

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-0842-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

South Branch Blacklick Creek Watershed (Finalized): AMD - Metals, AMD - pH
Begin Date 11/6/200 **Meeting Date** 11/16/20 **End Date** 1/5/2005 **Draft Date** **Final Date** 4/7/2005
Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids
Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100818-1600-kspyker NBRM
Stream Name North Branch Blacklick Creek (01182525) **Stream Code** 44503 **Strahler** 4
Survey ID 60921 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1600 **Latitude** 40.5155143 **Longitude** -78.9016837
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
NBRM - North Branch at Red Mill. Station located at abandoned bridge.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 0 # grids from second pan 0 **Subsample Size** 75

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Isonychia	14	3	CG	3	3	
Maccaffertium	8	3	SC	3	3	
Acroneuria	1	0	PR	3	3	
Sialis	2	6	PR	5	5	
Polycentropus	1	6	FC	4	4	
Ceratopsyche	9	5	FC	4	4	
Cheumatopsyche	4	6	FC	5	5	
Rhyacophila	1	1	PR	2	2	
Optioservus	24	4	SC	4	4	
Chironomidae	5	6	CG	5	5	
Oligochaeta	3	10	CG	5	5	
Cambarus	2	6	CG	4	4	
Orconectes	1	6	CG	4	4	

Benthic macroinvertebrate sample summary

Station ID 20100818-1600-kspyker NBRM
Stream Name North Branch Blacklick Creek (01182525) **Stream Code** 44503 **Strahler** 4
Survey ID 60921 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1600 **Latitude** 40.5155143 **Longitude** -78.9016837
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

		Standardized Metric Values						
		Freestone Riffle-Run						
	Raw Metric	2009	2009	6D200			Multihabitat	
Metric Names	Limestone	small	large	2007	2D100		2006	2009
Total Richness	13	39.4	39.4	37.1		41.9	70.2	72.2
Ephemeroptera Richness	2					33.3		
Trichoptera Richness	4					36.4		
EPT Richness	7			30.4	45.8	41.2	87.5	87.5
Trichoptera Richness (PTV 0-4)	1				27.8			
EPT Richness (PTV 0-4)	4	21.1	22.2					
Beck's Index (version 3)	5	13.2	16.7	12.8				
Beck's Index (version 4)	7				35.2	31.8		58.3
FC + PR + SH Richness	6				51.7			
Hilsenhoff Biotic Index	4.37	69.4	75.0	68.4	83.5		89.5	91.3
% Inolerant Individuals (PTV 0-3)	32.0	37.9	48.1				121.7	
% Intolerant Individuals (PTV 0-	76.0			82.2				
% Tolerant Individuals (PTV 7-10)	4.0						97.0	97.5
Shannon Diversity	2.06	72.0	72.8	71.1		84.8	107.3	96.7
IBI score		**42.1**	**45.7**	**50.4**	**48.8**	**44.9**	**90.7**	**83.9**

BCG Richness Ratio	0.44	**% Ephemeroptera**	29.3	**% Baetis**	0.0	**% Chironomidae**	6.7
BCG % Individuals Ratio	0.47	**% Plecoptera**	1.3	**% Ephemerella**	0.0	**% Simuliidae**	0.0
EV Indicator Taxa	1	**% Trichoptera**	20.0	**% Dominant Taxon**	32.0	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	18	**5. Channel Alteration**	15	**9. Contition of Banks**	16
2. Epifaunal Substrate	18	**6. Sediment Deposition**	16	**10. Bank Vegetative Protection**	17
3. Embeddedness	13	**7. Frequency of Riffles**	16	**11. Grazing/Disruptive Pressure**	16
4. Velocity/Depth Regimes	19	**8. Channel Flow Status**	11	**12. Riparian Vegetative Zone Width**	16

Instream Score (1. + 2. + 3. + 6.) = 65 **Riparian Score** (9. + 10. + 12.) = 49 **Total Score =** 191

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-0940-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100818-1217-kspyker BCDS
Stream Name Blacklick Creek (01169762) **Stream Code** 43979 **Strahler** 5
Survey ID 60925 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1217 **Latitude** 40.4761017 **Longitude** -79.1865971
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
BCDS - Black Lick Creek downstream. At bridge near Saylor Park. Iron flocculant.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 6

				BCG Attribute		
Taxa Name	**Individuals**	**PTV**	**FFG**	(coldwater)	(warmwater)	*any EV indicator taxa names are*
Ceratopsyche	6	5	FC	4	4	

Benthic macroinvertebrate sample summary

Station ID 20100818-1217-kspyker BCDS
Stream Name Blacklick Creek (01169762) **Stream Code** 43979 **Strahler** 5
Survey ID 60925 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100818 **Collection Time** 1217 **Latitude** 40.4761017 **Longitude** -79.1865971
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

Metric Names	Raw Metric	Standardized Metric Values						
		Freestone Riffle-Run			6D200			
	Limestone	2009 small	2009 large	2007		2D100	Multihabitat 2006	Multihabitat 2009
Total Richness	1	3.0	3.0	2.9		3.2	5.4	5.6
Ephemeroptera Richness	0					0.0		
Trichoptera Richness	1					9.1		
EPT Richness	1			4.3	6.5	5.9	12.5	12.5
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	0	0.0	0.0					
Beck's Index (version 3)	0	0.0	0.0	0.0				
Beck's Index (version 4)	0				0.0	0.0		0.0
FC + PR + SH Richness	1				8.6			
Hilsenhoff Biotic Index	5.00	61.7	66.7	60.8	74.2		79.5	81.2
% Inolerant Individuals (PTV 0-3)	0.0	0.0	0.0				0.0	
% Intolerant Individuals (PTV 0-	100.			108.1				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	0.00	0.0	0.0	0.0		0.0	0.0	0.0
IBI score		**10.8**	**11.6**	**28.0**	**17.9**	**3.0**	**32.9**	**33.2**

BCG Richness Ratio	0.00	**% Ephemeroptera**	0.0	**% Baetis**	0.0	**% Chironomidae** 0.0
BCG % Individuals Ratio	0.00	**% Plecoptera**	0.0	**% Ephemerella**	0.0	**% Simuliidae** 0.0
EV Indicator Taxa		**% Trichoptera**	100.0	**% Dominant Taxon**	100.0	**% Prosimulium** 0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	11	**5. Channel Alteration**	15	**9. Contition of Banks**	15
2. Epifaunal Substrate	10	**6. Sediment Deposition**	14	**10. Bank Vegetative Protection**	18
3. Embeddedness	8	**7. Frequency of Riffles**	13	**11. Grazing/Disruptive Pressure**	15
4. Velocity/Depth Regimes	15	**8. Channel Flow Status**	8	**12. Riparian Vegetative Zone Width**	8

Instream Score (1. + 2. + 3. + 6.) = 43 **Riparian Score** (9. + 10. + 12.) = 41 **Total Score =** 150

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-1134-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100819-1000-kspyker ECDS
Stream Name Elk Creek (01174107) **Stream Code** 44523 **Strahler** 3
Survey ID 60922 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 1000 **Latitude** 40.5280317 **Longitude** -78.8890632
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
ECDS - Elk Creek Mouth.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 67

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Baetis	1	6	CG	4	5	
Isonychia	14	3	CG	3	3	
Ceratopsyche	20	5	FC	4	4	
Cheumatopsyche	8	6	FC	5	5	
Optioservus	10	4	SC	4	4	
Atherix	1	2	PR	3	3	
Antocha	2	3	CG	4	4	
Simulium	1	6	FC	5	5	
Chironomidae	9	6	CG	5	5	
Oligochaeta	1	10	CG	5	5	

Benthic macroinvertebrate sample summary

Station ID 20100819-1000-kspyker ECDS
Stream Name Elk Creek (01174107) **Stream Code** 44523 **Strahler** 3
Survey ID 60922 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 1000 **Latitude** 40.5280317 **Longitude** -78.8890632
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

Metric Names	Raw Metric	Standardized Metric Values						
	Limestone	2009	2009	Freestone Riffle-Run 6D200			Multihabitat	
		small	large	2007	2D100		2006	2009
Total Richness	10	30.3	30.3	28.6		32.3	54.0	55.6
Ephemeroptera Richness	2					33.3		
Trichoptera Richness	2					18.2		
EPT Richness	4			17.4	26.1	23.5	50.0	50.0
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	1	5.3	5.6					
Beck's Index (version 3)	1	2.6	3.3	2.6				
Beck's Index (version 4)	4				20.1	18.2		33.3
FC + PR + SH Richness	4				34.5			
Hilsenhoff Biotic Index	4.69	65.5	70.8	64.6	78.8		84.5	86.3
% Inolerant Individuals (PTV 0-3)	25.4	30.0	38.2				96.5	
% Intolerant Individuals (PTV 0-	70.1			75.8				
% Tolerant Individuals (PTV 7-10)	1.5						99.5	100.0
Shannon Diversity	1.85	64.7	65.4	63.9		76.2	96.4	86.9
IBI score		**33.1**	**35.6**	**42.2**	**31.9**	**33.6**	**80.2**	**68.7**

BCG Richness Ratio	0.25	**% Ephemeroptera**	22.4	**% Baetis**	1.5	**% Chironomidae**	13.4
BCG % Individuals Ratio	0.29	**% Plecoptera**	0.0	**% Ephemerella**	0.0	**% Simuliidae**	1.5
EV Indicator Taxa		**% Trichoptera**	41.8	**% Dominant Taxon**	29.9	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	15	**5. Channel Alteration**	15	**9. Contition of Banks**	16
2. Epifaunal Substrate	15	**6. Sediment Deposition**	15	**10. Bank Vegetative Protection**	18
3. Embeddedness	10	**7. Frequency of Riffles**	17	**11. Grazing/Disruptive Pressure**	14
4. Velocity/Depth Regimes	13	**8. Channel Flow Status**	13	**12. Riparian Vegetative Zone Width**	13

Instream Score (1. + 2. + 3. + 6.) = 55 **Riparian Score** (9. + 10. + 12.) = 47 **Total Score =** 174

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (990222-1300-ALF) Abandoned Mine Drainage - Metals, Abandoned Mine Drainage - Other Habitat Alterations, Abandoned Mine Drainage - Siltation	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Elk Creek (Cambria County) (Finalized): AMD - Metals

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 4/2/2005

Benthic macroinvertebrate sample summary

Station ID 20100819-0900-kspyker BCAEC
Stream Name North Branch Blacklick Creek (01182525) **Stream Code** 44503 **Strahler** 4
Survey ID 60923 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 0900 **Latitude** 40.5284775 **Longitude** -78.8889974
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
BCAEC - Black Lick Creek above Elk Creek. Low flow.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 9 # grids from second pan 28 **Subsample Size** 223

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Baetis	3	6	CG	4	5	
Centroptilum	1	2	CG	3	3	
Isonychia	12	3	CG	3	3	
Leucrocuta	1	1	SC	3	3	
Stenacron	2	4	SC	4	4	
Maccaffertium	120	3	SC	3	3	
Caenis	15	7	CG	5	5	
Leptophlebia	2	4	CG	3	3	
Ephemera	2	2	CG	3	2	
Leuctra	1	0	SH	2	2	
Acroneuria	1	0	PR	3	3	
Sialis	1	6	PR	5	5	
Nigronia	2	2	PR	3	3	
Chimarra	1	4	FC	4	4	
Ceratopsyche	3	5	FC	4	4	
Cheumatopsyche	5	6	FC	5	5	
Psephenus	2	4	SC	4	4	
Ectopria	1	5	SC	3	3	
Optioservus	20	4	SC	4	4	
Stenelmis	2	5	SC	5	5	
Atherix	1	2	PR	3	3	
Antocha	3	3	CG	4	4	
Chironomidae	22	6	CG	5	5	

Benthic macroinvertebrate sample summary

Station ID 20100819-0900-kspyker BCAEC
Stream Name North Branch Blacklick Creek (01182525) **Stream Code** 44503 **Strahler** 4
Survey ID 60923 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 0900 **Latitude** 40.5284775 **Longitude** -78.8889974
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

		Standardized Metric Values						
		Freestone Riffle-Run						
	Raw Metric	2009	2009		6D200		Multihabitat	
Metric Names	Limestone	small	large	2007		2D100	2006	2009
Total Richness	23	69.7	69.7	65.7		74.2	124.3	127.8
Ephemeroptera Richness	9					150.0		
Trichoptera Richness	3					27.3		
EPT Richness	14			60.9	91.5	82.4	175.0	175.0
Trichoptera Richness (PTV 0-4)	1				27.8			
EPT Richness (PTV 0-4)	10	52.6	55.6					
Beck's Index (version 3)	12	31.6	40.0	30.8				
Beck's Index (version 4)	18				90.5	81.8		150.0
FC + PR + SH Richness	8				69.0			
Hilsenhoff Biotic Index	3.80	76.5	82.7	75.4	92.0		98.6	100.7
% Inolerant Individuals (PTV 0-3)	64.6	76.4	97.1				245.5	
% Intolerant Individuals (PTV 0-	79.4			85.8				
% Tolerant Individuals (PTV 7-10)	6.7						94.2	94.7
Shannon Diversity	1.82	63.7	64.4	63.0		75.1	95.0	85.6
IBI score		**61.8**	**68.2**	**63.6**	**74.1**	**73.4**	**98.0**	**96.7**

BCG Richness Ratio	0.92	**% Ephemeroptera**	70.9	**% Baetis**	1.3	**% Chironomidae**	9.9
BCG % Individuals Ratio	1.82	**% Plecoptera**	0.9	**% Ephemerella**	0.0	**% Simuliidae**	0.0
EV Indicator Taxa	1	**% Trichoptera**	4.0	**% Dominant Taxon**	53.8	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	5	**5. Channel Alteration**	15	**9. Contition of Banks**	17
2. Epifaunal Substrate	3	**6. Sediment Deposition**	14	**10. Bank Vegetative Protection**	20
3. Embeddedness	12	**7. Frequency of Riffles**	3	**11. Grazing/Disruptive Pressure**	16
4. Velocity/Depth Regimes	8	**8. Channel Flow Status**	2	**12. Riparian Vegetative Zone Width**	16

Instream Score (1. + 2. + 3. + 6.) = 34 **Riparian Score** (9. + 10. + 12.) = 53 **Total Score =** 131

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (20051130-0940-joboylan) Abandoned Mine Drainage - Metals	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Benthic macroinvertebrate sample summary

Station ID 20100819-1040-kspyker EC271
Stream Name Elk Creek (01174107) **Stream Code** 44523 **Strahler** 3
Survey ID 60924 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 1040 **Latitude** 40.5372596 **Longitude** -78.8656772
HUC8 05010007 Conemaugh. Pennsylvania.
Station Location Comments
EC271 - Elk Creek at route 271.
Biology / Habitat Comments
Land Use Comments
Station Impairment Status Comments

Taxa List

grids from first pan 28 # grids from second pan 28 **Subsample Size** 33

Taxa Name	Individuals	PTV	FFG	BCG Attribute (coldwater)	BCG Attribute (warmwater)	*any EV indicator taxa names are*
Isonychia	1	3	CG	3	3	
Leuctra	1	0	SH	2	2	
Sialis	1	6	PR	5	5	
Ceratopsyche	7	5	FC	4	4	
Cheumatopsyche	9	6	FC	5	5	
Antocha	5	3	CG	4	4	
Chironomidae	9	6	CG	5	5	

Benthic macroinvertebrate sample summary

Station ID 20100819-1040-kspyker EC271
Stream Name Elk Creek (01174107) **Stream Code** 44523 **Strahler** 3
Survey ID 60924 **Sample Method** 6-Dframe Composite, 200 subsample
Collection Date 20100819 **Collection Time** 1040 **Latitude** 40.5372596 **Longitude** -78.8656772
HUC8 05010007 Conemaugh. Pennsylvania.

Metrics and IBI

		Standardized Metric Values						
		Freestone Riffle-Run						
	Raw Metric	2009	2009		6D200		Multihabitat	
Metric Names	Limestone	small	large	2007		2D100	2006	2009
Total Richness	7	21.2	21.2	20.0		22.6	37.8	38.9
Ephemeroptera Richness	1					16.7		
Trichoptera Richness	2					18.2		
EPT Richness	4			17.4	26.1	23.5	50.0	50.0
Trichoptera Richness (PTV 0-4)	0				0.0			
EPT Richness (PTV 0-4)	2	10.5	11.1					
Beck's Index (version 3)	3	7.9	10.0	7.7				
Beck's Index (version 4)	4				20.1	18.2		33.3
FC + PR + SH Richness	4				34.5			
Hilsenhoff Biotic Index	5.06	60.9	65.9	60.1	73.3		78.5	80.2
% Inolerant Individuals (PTV 0-3)	21.2	25.1	31.9				80.7	
% Intolerant Individuals (PTV 0-	42.4			45.9				
% Tolerant Individuals (PTV 7-10)	0.0						101.0	101.5
Shannon Diversity	1.64	57.3	58.0	56.7		67.5	85.5	77.1
IBI score		**30.5**	**33.0**	**34.6**	**30.8**	**27.8**	**72.1**	**63.2**

BCG Richness Ratio	0.40	**% Ephemeroptera**	3.0	**% Baetis**	0.0	**% Chironomidae**	27.3
BCG % Individuals Ratio	0.06	**% Plecoptera**	3.0	**% Ephemerella**	0.0	**% Simuliidae**	0.0
EV Indicator Taxa		**% Trichoptera**	48.5	**% Dominant Taxon**	27.3	**% Prosimulium**	0.0

Not impaired N **Biology impaired** N **Habitat impaired** N **Insufficient data** Y
Rock pick influenced assessment N **Impact is localized** N **Re-evaluate designated use** N

Physical Habitat Assessment

Pool-Glide Assessment? N

1. Instream Cover	16	**5. Channel Alteration**	17	**9. Contition of Banks**	16
2. Epifaunal Substrate	16	**6. Sediment Deposition**	13	**10. Bank Vegetative Protection**	17
3. Embeddedness	13	**7. Frequency of Riffles**	15	**11. Grazing/Disruptive Pressure**	19
4. Velocity/Depth Regimes	9	**8. Channel Flow Status**	15	**12. Riparian Vegetative Zone Width**	19

Instream Score (1. + 2. + 3. + 6.) = 58 **Riparian Score** (9. + 10. + 12.) = 52 **Total Score =** 185

Field

Lab samples

Temperature (°C)	0	**Dissolved Oxygen (mg/L)**	0	**Flow (CFS)**	0
pH	0	**Total Alkalinity (mg/L as CaCO3)**	0	**Conductivity (uS/cm)**	0

Use Assessment Status for Stream

	Designated	Existing Use
Aquatic Life	Impaired (990222-1100-ALF) Abandoned Mine Drainage - Metals, Abandoned Mine Drainage - Siltation	
Fish Consumption		
Potable Water Supply		
Recreation		

TMDL Information (if any)

Kiskiminetas-Conemaugh River Watersheds TMDL (Finalized): AMD - Metals, AMD - pH, AMD - Siltation, AMD - Suspended Solids

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 1/29/201

Elk Creek (Cambria County) (Finalized): AMD - Metals

Begin Date **Meeting Date** **End Date** **Draft Date** **Final Date** 4/2/2005

Below is some Biological Condition Gradient (BCG Attributes) information. The taxa list for each station lists a BCG number for each taxa.

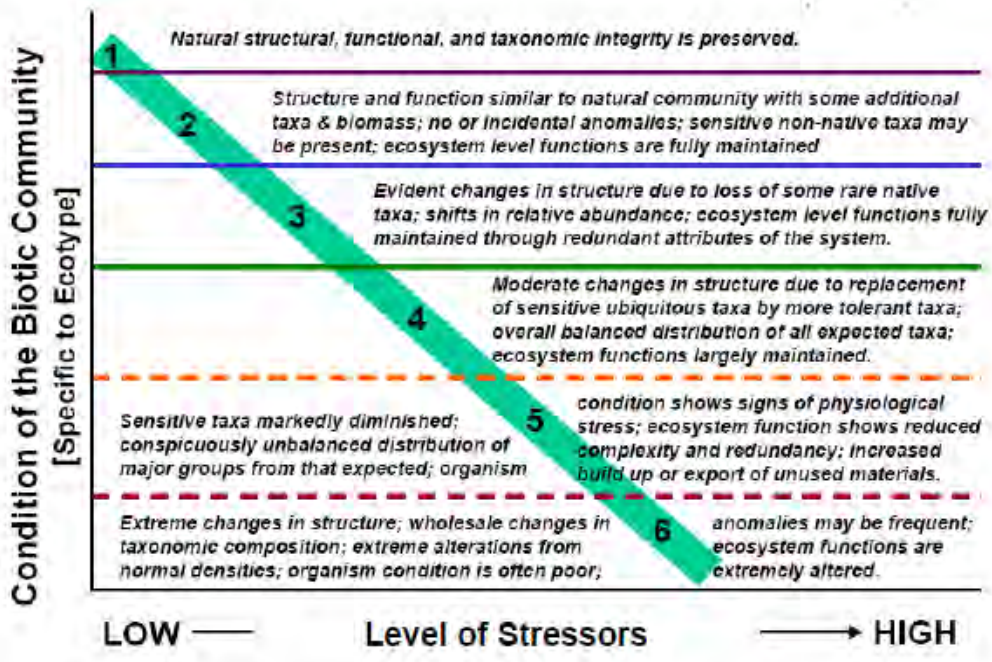

FIGURE 1. Conceptual Diagram of the Biological Condition Gradient. (Adapted from Jackson 2003).

TABLE 1. Biological Condition Gradient Attributes.

Measured Response	BCG Attribute	Attribute Description*
Taxonomic Composition/ Structure	1	Endemic Species
	2	Sensitive Rare Taxa
	3	Sensitive Ubiquitous Taxa
	4	Taxa of Intermediate Tolerance
	5	Tolerant Taxa
	6	Introduced Taxa
Organism Condition/ System Performance	7	Organism Condition
	8	Ecosystem Function
Habitat/Biota Interactions	9	Spatial/Temporal Stressors
	10	Ecosystem Connectance

* - See Jackson (2005) for further discussion of biological attributes.

Sampling during June through September requires an IBI score of >50 for attainment, although scores between 40 and 50 can be further evaluated to determine impairment. Subsample size should be 200 +/- 40 to run the IBI metrics. For the benthic macroinvertebrate sample summary there is a two-sided one paper print out in two files. All stations but the North Branch above Elk Creek were marked impaired. And it was the only station that had the required subsample size.

BCDS:

Blacklick Creek downstream at bridge near Saylor Park. Heavy iron precipitation with some substrate areas having bedrock. Only one stonefly species (6 individuals) was collected at this station. This station is impaired and is not attaining its aquatic life use (ALU). The IBI for 2009 small streams is 10.8 (impaired).

The physical habitat (score 150) at this station scored marginal in 4 categories (epifaunal substrate, embeddedness, channel flow status and riparian vegetative zone width).

BCBW:

Blacklick Creek below Wehrum. The total subsample size was 4 individuals with one insect from each of four taxa. This station is also impaired with an IBI = 38.5 (keep in mind that to calculate the IBI, subsample size should be around 200 plus or minus 40).

The physical habitat (score 153) at this station scored marginal in 4 categories (epifaunal substrate, embeddedness, velocity/depth regimes, channel flow status and frequency of riffles).

BCAW:

Blacklick Creek above Wehrum. The total subsample size was 56 individuals, which were mostly tolerant taxa. Some stoneflies were present, along with some beetles, fly larvae and a dobsonfly larvae. This station had an IBI = 22.3 (impaired).

The physical habitat (score 176) at this station scored marginal in 2 categories (embeddedness and channel flow).

SB01:

South Branch Mouth in Vintondale. The total subsample size was one (a stonefly). This station had an IBI = 10.8 (impaired).

The physical habitat (score 156) at this station scored marginal in 3 categories (embeddedness, velocity/depth regimes, and channel flow status).

NBRM:

North Branch at Red Mill. Sedimentation was present on the substrate. A total of 75 insects from 13 taxa were collected in the subsample (still below the 200 insects needed to accurately run the IBI metric. Some mayflies, stoneflies, and caddisflies were present in the sample, but the majority of insects collected were tolerant. The IBI = 42.1 (impaired).

The physical habitat (score 191) at this station scored marginal in 1 category (channel flow status).

NBAEC:

North Branch above Elk Creek. Sedimentation was present on the substrate at this station also and the water level was low. A total of 223 insects from 23 taxa were collected at this station. Mayflies, stoneflies, and caddisflies accounted for 14 of the 23 taxa with one mayfly species (Maccaffertium) dominating the sample. Still many taxa in the sample were tolerant. The IBI = 61.8 (unimpaired).

The physical habitat (score 131) at this station scored marginal in 5 categories (instream cover, epifaunal substrate, velocity/depth regimes, channel flow status and frequency of riffles).

ECDS:

Elk Creek Mouth. Sedimentation was present on the substrate. A total of 67 insects from 10 taxa were collected. Some mayflies and caddisflies were collected. The sample had an IBI = 33.1 (impaired). The majority of insects in the sample were tolerant.

The physical habitat (score 174) at this station scored marginal in 1 category (embeddedness).

EC271:

Elk Creek at Rt. 271. Sedimentation and algae was present on the substrate. Only 33 insects from 7 taxa were collected at this station, the majority of which are tolerant. The IBI = 30.5 (impaired). A mayfly, stonefly, and 2 caddisfly species were collected in the sample.

The physical habitat (score 185) at this station scored marginal in 1 category (velocity/depth regimes).

Appendix D – Non Title IV Expenditures in the Upper Blacklick Creek Qualified Hydrologic Unit.

Grants:

Year	Document #	Recipient	Amount
1999	359169	Blacklick Creek Watershed Association Assessment of Non-point Sources	$96,370.00
1999	3591053	Stream Restoration Inc. Laurel Run Headwaters	$449,342.00
1999	359972	AMD & Art Inc. AMD& Art Vintondale System	$285,000.00
2000	350564	Blacklick Creek Watershed Association Bracken Run Assessment	$5900.00
2000	350536	Blacklick Creek Watershed Association Coal Pit Run AMD Abatement	$12,500.00
2002	3521129	Blacklick Creek Watershed Association Blacklick Creek Watershed Assessment and Restoration Plan	$141,002.00
2003	4100017581	Blacklick Creek Watershed Association Coal Pit Run Passive Treatment Systems	$146,810.00

Bond Forfeitures/Act 181:

Number	Problem Area	Contractor	Completed	Cost
BF 359-101.1	PA0798	Earthmovers Unlimited	7/10/97	$332,884.12
BF 126-101.1	PA0401	Swistock Contracting	9/22/88	$248,108.44
BF 61-101.1	PA0798	Curry Excavating	4/29/86	$99,024.68
BF 258-101.1	PA4356S	M.B. Energy Inc – Act 181	11/1990	$56,700.00